

Indian Coal Mining Industry: Major Bottlenecks – Land, Forest/Environment Clearances and Infrastructure

Dr.R.Giri Prasad,

Associate Professor, Dept. Of Petroleum Technology, Aditya Engineering College, Surampalem – 533437

ABSTRACT:

Energy is life line to everyone. Every country growth and development directly or indirectly depended on consumption of its energy resources and production of goods. India like developing country energy is backbone. Our 50% of energy comes from the coal. 75% of Indian power sector depends on coal. India's current coal needs are rapidly rising and we are increasingly becoming dependent on imported coal due stagnant domestic coal production. This is bound to create serious energy security issues for the country similar on the lines of crude oil and natural gas where reliance on imports is high. Stagnancy in domestic coal production is contradicted by the fact that India has the fifth largest proven coal reserves in the world and is the third largest coal producer in the world today. Despite having large reserves and being heavily dependent on coal as source of primary energy, we are still short of meeting our demand for Coal.

In order to maximize production of coal, the various limiting factors, deterrent to increasing production and severely faced by the coal sector, need to be addressed by the Government. The Government has to take certain initiatives in this regard. The issues are: Infrastructure development, getting environmental and forest clearances, land acquisition and effective replace and rehabilitation plan for project affected people and families. In this paper gives the details of present major problems facing by Indian Coal Mining Industry and suggested measures for overcome the bottlenecks to reach the country demanded production.

I. INTRODUCTION

Energy is central to development & poverty reduction measures and can be described as “the backbone of civilization”. World's population is forecast to increase from six billion, currently, to over eight billion by 2030. With this explosion of population and particularly, with the emerging dynamic new economies, the pursuit of quantity-wise and quality-wise affordable and reliable source of energy is presenting unprecedented economic, social and environmental challenges. Finding ways to provide energy, those will lift emerging nations' economies, provide employment and boost quality of life across the globe, and to do so in a way which is within the means of the common mass, is the major challenge before the energy providers.

The energy dependence on coal is more pronounced in case of developing countries like India and China. In India, coal is currently the prime source of energy as it provides about 52% of the commercial energy and about 67% of the electricity generation is coal based.

Key impediments in developing coal mines are:-

- a) Environmental Clearance and Forest Clearance
- b) Land Acquisitions and R & R
- c) Infrastructure Development

Bottlenecks / impediments can be addressed by suitable

- Policy interventions
- Speedy Clearances and acquisition
- Close co-ordination and monitoring mechanism

1.1 Worldwide Energy From Coal

- 26% of the world's primary energy
- 39% of all electricity
- 1.6 B w/o electricity –coal a solution
- Widely dispersed around the globe
- Distribution varies notably from that of oil and gas
- United States – 26% -‘Saudi Arabia of Coal’
- Former Soviet Union – 23%
- China and India – 22%

- None in the Middle East
- Global reserves of 980 billion tonnes
- 3 times the amount of oil on an energy basis

Worldwide Coal Production, Exports and Imports in 2011

Table – 1 Top Coal Producing Countries World Wide (Million Tonnes)

Sl.No	Country	Coking	Steam	Lignite	Total
1.	PR China	504	2831	136	3471
2.	USA	82	849	74	1004
3.	India	35	509	41	585
4.	Australia	146	199	69	414
5.	Indonesia	3	373	-	376
6.	Russia	78	178	78	334
7.	S.Africa	3	250	-	253
8	Germany	NA	NA	176	189
9	Poland	11	65	NA	139
10	Kazakhstan	13	98	NA	117
11	Colombia	NA	80	NA	80
Total		967	5670	1041	7678

Source: World Coal Association

Table –2 Major Coal Exporters in the world (Million Tonnes)

Sl.No	Country	Steam	Coking	Total
1.	Indonesia	309	-	309
2.	Australia	144	140	284
3.	Russia	110	14	124
4.	USA	34	63	97
5.	Colombia	75	-	75
6.	S.Africa	72	-	72
7.	Kazakhstan	33	1	34
Total World		861	276	1142*

Source: World Coal Association

Table –3 Major Coal Importers in the world (Million Tonnes)

Sl.No	Country	Steam	Coking	Total
1.	PR China	146	38	190
2.	Japan	121	54	129
3.	S.Korea	97	32	129
4.	India	86	19	105
5.	Chinataipei	62	4	66
6.	Germany	32	9	41
7.	UK	27	6	33
Total		861	276	1142*

Source: World Coal Association

Figure.1 Coal and Lignite Resources in India

A.CIL :COAL PRODUCING SUBSIDIARIES
 EASTERN COALFIELDS LTD. (1)
 BHARAT COKING COAL LTD. (2)
 CENTRAL COALFIELDS LTD. (3)
 NORTHERN COALFIELDS LTD. (4)
 WESTERN COALFIELDS LTD. (5)
 SOUTH EASTERN COALFIELDS LTD.(6)
 MAHANADI COALFIELDS LTD. (7)
 NORTH EASTERN COALFIELDS. (8)
 (A UNIT UNDER CIL(HQ))
PLANNING & DESIGN INSTITUTE
CENTRAL MINE PLANNING & DESIGN
INSTITUTE (CMPDIL)
B.SINGARENI COLLIERIES CO. LTD. (9)

C.NEYVELI LIGNITE CORPORATION (10)



1.2 Indian Power Sector Scenario:

Installed Capacity

All India total generation capacity	2, 09,276 MW*
Coal Based Generation capacity	1, 20,103MW (about 57 %)
Capacity addition achieved during XI Plan	57,964 MW
Coal based Capacity addition	48,540 MW (> 83%)

1.3 PROJECTED CAPACTIY (Figs in GW)#

Terminal Year	2017	2022	2027	2032
8% GDP Growth Rate	306	425	575	778
9% GDP Growth Rate	337	488	685	960

As per Approach Paper for 12th Plan, capacity addition target is 88425 MW, out of which 71228 MW through Thermal, 11897 MW from Hydro & 5300 MW from Nuclear.

1.4 Importance of Coal:

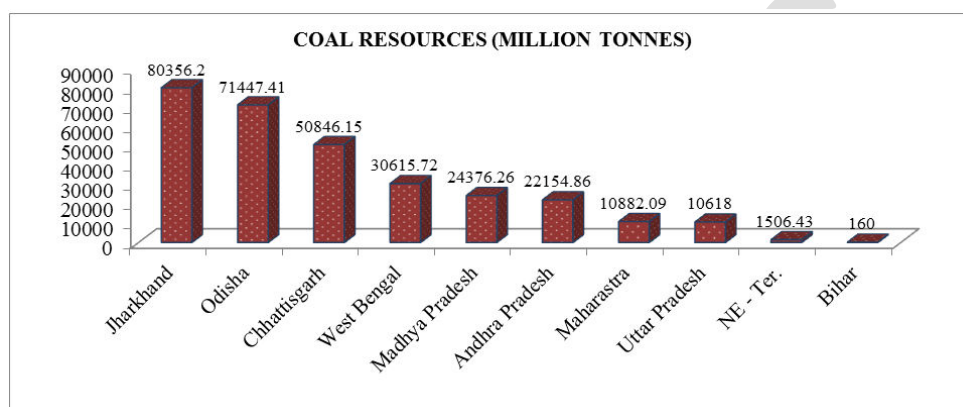
Continuous gap between Demand & Supply and the level of Import is consistently going up. Total import of Coal -Coking as well as Power Grade likely to be ~ 193 mts. And this story goes back to late 1990s when demand started outstripping domestic coal production. Basic reason has been the failure of the Industry on starting new Projects & in many cases on increasing production even from on-going Projects. While Coking Coal Import is understandable since our resources of this type of Coal are rather limited, the import of non-coking coal is something which is difficult to digest. Reasons for the Indian Coal Industry failing to meet the country's Demand have been analysed on a continuous basis. Getting the required Land for mining and obtaining Forest and Environmental Clearances from State and Central level is become very difficult. The files are pending at various level on officers tables by years. Dependency on Coal will continue as the primary & most reliable source for power generation in India.

Table.4 Coal Reserves in India (Billion Tonnes)

Type	Proved	Indicated	Inferred	Total	%
Prime Coking	4.61	0.7	0	5.31	1.81
Medium Coking	12.84	11.95	1.88	26.67	9.09
Semi Coking	0.48	1	0.23	1.71	0.58
Sub Total Coking	17.93	13.65	2.11	33.69	11.5
Non – Coking	99.62	128.42	30.28	258.32	88
Tertiary Coal	0.59	0.1	0.8	1.49	0.52
Total all types	111.14	142.17	33.18	293.5	100

Source: Ministry of Coal

Figure.2 State wise Coal Resources (as on 01 – 04 – 2012)



Source: Ministry of Coal

Figure.3 Raw Coal Productions in India (Source: Ministry of Coal)

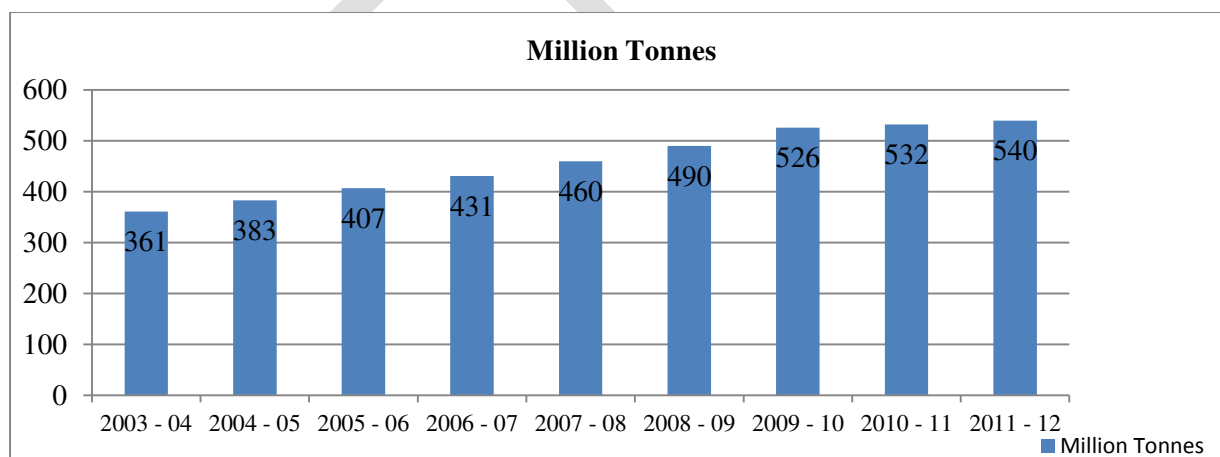


Table.5 Coal production during the X and XI plan(Million Tonnes)

Source: MOC

Coal Producers	Actual production during X plan		Actual production during XI plan	
	2002-03	2006-07	2007-08	2011-12
CIL	290.69	360.91	379.46	435.83
SCCL	33.23	37.71	40.60	52.21
Other PSUs	1.51	1.77	2.11	2.71
Total PSUs	325.43	400.39	422.17	490.75
Tata Steel & Captive Blocks	11.44	24.65	28.38	41.98
Meghalaya	4.40	5.79	6.54	7.21
Total Others	15.84	30.44	34.92	49.19
ALL INDIA	341.27	430.83	457.08	539.94
UG	63.16	57.75	58.90	51.83
OC	278.11	373.08	398.18	488.11
Total	341.27	430.83	457.08	539.94
Coking	30.19	32.08	34.46	51.65
Non-Coking	311.08	398.75	422.63	488.29
TOTAL	341.27	430.83	457.08	539.94
	CAGR 5.6% in X Plan period		CAGR 4.35% in X Plan period	

1.5 Characteristics of Indian coal deposits

- Limited reserves of coking coal (32.28 bt).
- High ash and low calorific values (40% & above & average 4000 k.cal./kg-uhv)
- Mismatch in location of deposits and major consumption centres
- High cost of transport
 - Pit head price – 43%
- Landed price of coal -----
 - Royalty/cess/sales tax –13%
 - Transportation – 44%

Table.6 All India demand / supply scenario- Past Trend

(Source: Economic Times of India)

Figs in Mt	TY IX Plan	TY X Plan	XI Plan				
	01-02	06-07	07-08	08-09	09-10	10-11	11-12
	(Act)	(Act)	(Act)				
Demand	354	474	493	550	598	656	650
CAGR %	2.32	6.00					6.52
Demand Materialization	352	464	504	549	588	593	636
Through Ind. Supply	331	421	454	490	515	524	537
CAGR %	2.15	4.93					4.98
Through Import	21	43	50	59	73	69	99
Coking	11	18	22	21	25	20	30
Non-coking	10	25	28	38	48	49	69

Source: Planning Commission

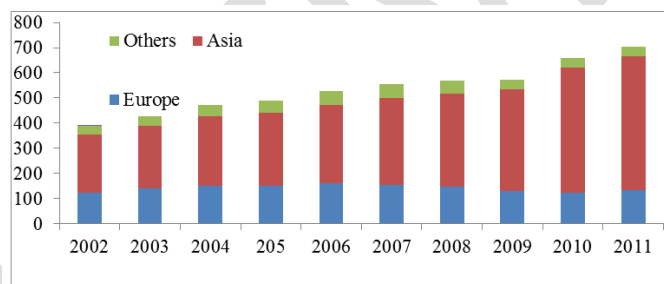
Table.7 All India demand / supply scenario – Future Projection

Figs in Mt	TY XI Plan 11-12	XII Plan			XIII Plan	
		12-13 BE	16-17 Proj		21-22 Proj	
Demand	650	773 *	980.50		1373	
CAGR %	6.52		8.57		6.97	
		BE/AP 12-13	BAU	OPT	BAU	OPT
Through Ind Supply	536	580	715 #	795 #	950	1100
CAGR %	4.98		5.89	8.16	5.85	6.71
Gap		192.54	265.50	185	423	273
Coking		30.00				
Non-coking		162.54				

Considering CIL's supply of 556.4 Mt & 615 Mt as mentioned in Working Group Report XII Plan in 'BAU' & OPT Scenarios respectively

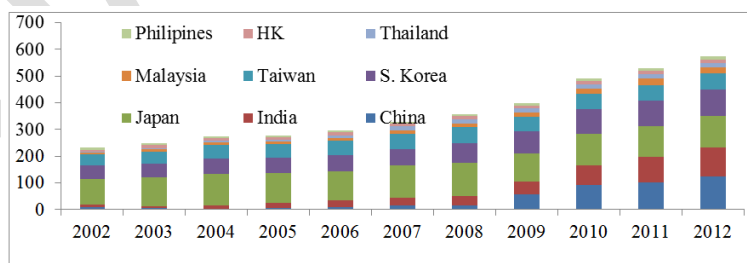
Source: Planning Commission of India

Figure.4 Trends in Global Coal Imports in MLT (Source: World Coal Association)



In last 10 years, Global trade in steam coal has almost doubled, solely on account of surge in Asian Imports – Today Asia accounts for 80% of Global Imports

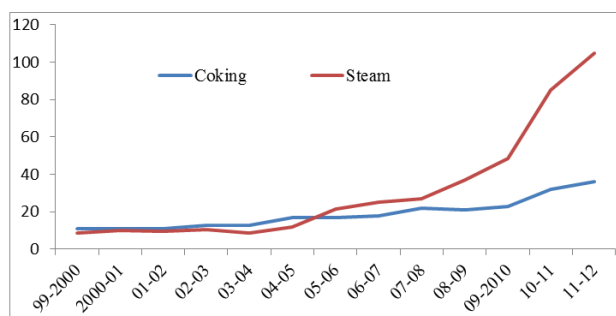
Figure.5 Trends in Asian Coal Imports in MLT (Source: World Coal Association)



Loss to the Nation due to delayed permissions:

- Loss of valuable foreign exchange for 200 Mt import @ \$150 (taking Rs55 per \$) per tonne is nearly Rs165000 crores per annum if India imports the coal to feed to its power stations.
- Loss of revenue to state and governments by way of royalty (@ of Rs 100 per tonne) is Rs.2000 crores per annum.
- Loss of sales tax (4%) and income tax(30%) to the Govt Rs 10000crores crores.

Figure.6 Historical Trends in Coal Imports in India (Million Tonnes)



Source: Coal Controller Organization +In House estimate

Figure.7 Projected Coal Imports in India (Million Tonnes)

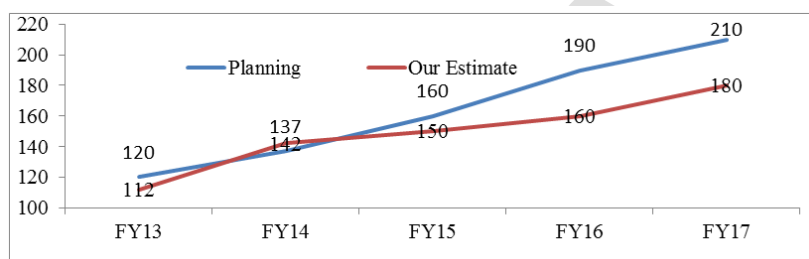


Figure.8 India Energy Basket 2010

(524 MTOE)

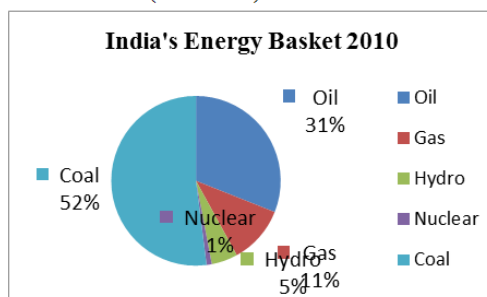
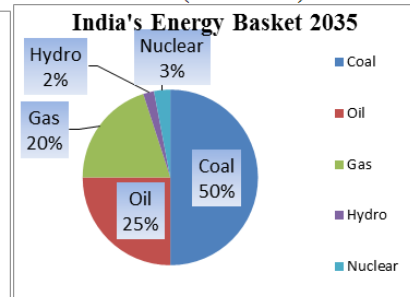


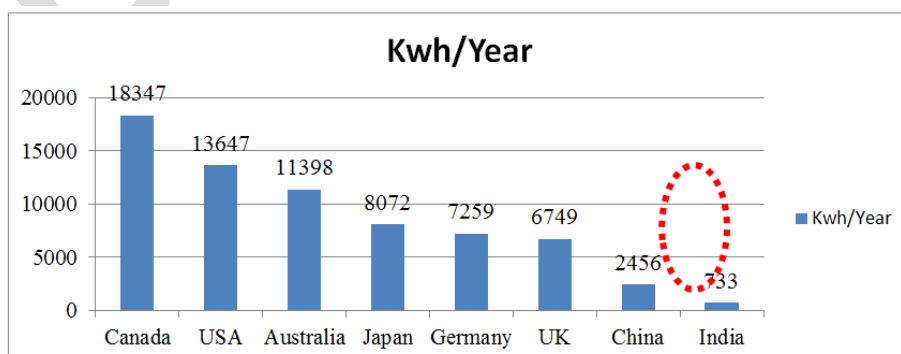
Figure.9 India's Energy Basket 2035

(1900 MTOE)



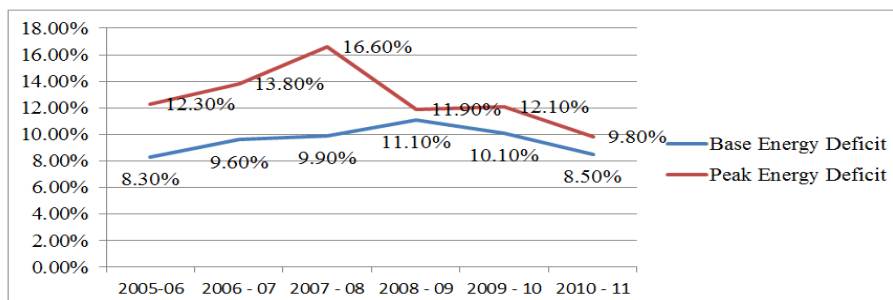
Source: CEA

Figure.10 Per capita electricity consumption



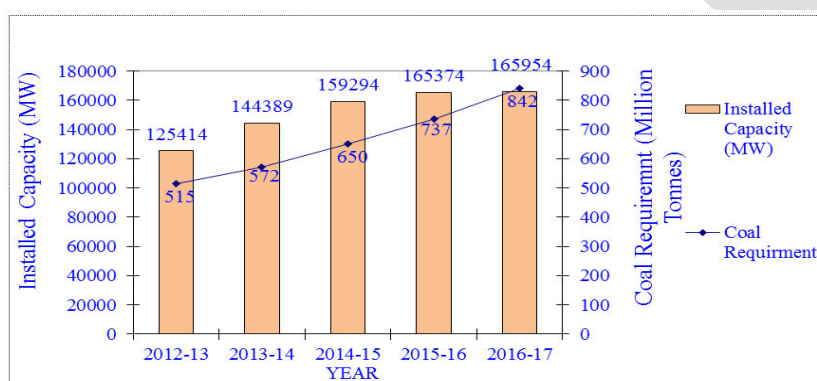
Source: CEA

Figure.11 Deficit in Power demand and supply



Source: CEA

Figure.12 Capacity Addition & Coal Requirement for 12th Plan



Source: Planning Commission Data & CEA

II. ENVIRONMENTAL CLEARANCE AND FOREST CLEARANCE:

Environment Clearance:

On account of Land Acquisition difficulties, quite a number of projects spread over different coalfields have either not taken off or else are operating at sub optimal levels. For this reason production is not being obtained at the levels cleared by MOEF while granting the Environment Clearance. On the other hand, there are mines where land is available and where from production can be increased but this is not being possible on account of lack of Environmental Clearance.

If these mines are allowed to increase their production to the extent, other mines having Environmental Clearance are not achieving their rated production level, the total pollution load that would be generated will not exceed the level approved by MOEF.

It should therefore, be possible and logical for MOEF to permit the ongoing mines not facing land constraints to increase their production level to make up for the short fall from those mines where land is a problem

The EC process takes about 14 months excluding the time consumed in Public Consultation process. Main reasons for delay in EC as observed are -

- Obtaining Terms of Reference from MOEF for each and every proposal specially when more than 86% conditions are common for OCP & U/G mines. Thereby leading to repetition of the process.
- Delayed Public Hearing and issuance of PH proceedings by SPCB. The time limit prescribed for public consultation/hearing, including receipt of proceedings, is although 45 days but the time taken is much more and in some cases, it is even more than 2-3 years.
- Linking of Environment Clearance with Forest Clearance.

2.1 Forest Clearance Stages:

1. Estimation of Land Requirement
2. Application to Nodal Officer/PCCF/DFO for Forest Diversion
3. Survey of forest area, Enumeration of trees and demarcation of Forest land
4. NOC from Village Advisory Committee / Gram Samittee
5. NOC on jungle-jhari land / Revenue forest by State Govt.
6. NOC under FRA-2006
7. DGPS survey & its authentication by State Bodies like ORSAC (in Odisha)
8. Processing of Forest proposal : DFO - CF - CCF/RCCF - PCCF - Secy (Forest) State Govt - MoEF, New Delhi
9. Site Inspection by Regional office of MOEF – Submission of Report to MOEF, New Delhi
10. Presentation to Forest Advisory Committee of MOEF by AIG (Forest)
11. Approval of FAC recommendation by Hon'ble Minister of Env. & Forests
12. Stage-I forest clearance by MoEF, Delhi
13. Demand note from DFO for NPV of trees & Compensatory Afforestation - Payment by block allocatee, Identification of land for compensatory afforestation
14. Submission of compliance report of Stage-I clearance to DFO - CF - CCF/RCCF - PCCF - Secy (Forest) State Govt - MoEF, New Delhi
15. Processing of Stage-II proposal at MOEF – approval by IG / DG, Forests
16. Stage-II clearance from MoEF
17. Order by DFO/RCCF to start demarcation of forest land, Safety zone and CA areas
18. Approval of State Forest Deptt. to start tree felling and transportation of tree logs

MOC schedule stipulates 6 months to complete all these activities – Unrealistic in present scenario

2.2 Forest Clearance - Factors contributing to Delay

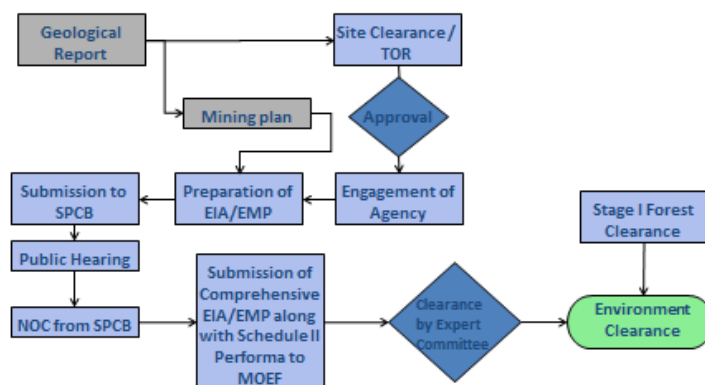
- Issuance of “No-Objection Certificate” on jungle-jhari by DistAdministration.
- Issuance of “No-Objection Certificate” on Forest Rights Act by DistAdmn - Conductance of Gram Sabhas& certification of its proceedings.
- Old / not updated land records / forest records, Mismatch of habitants / persons in actual possession of the forest land, wrt available land records.
- Involvement of number of Central / State Government departments and slow processing of proposal at State Forest Dept. and MOEF.
- Site inspection & submission of inspection report by Regional Office of MOEF to MOEF, New Delhi.
- Non-availability of alternate land for compensatory afforestation.

2.3 Forest Clearance – Suggested Measures

- Once the FC application is received by the State Forest authority from the project proponent, all the deficiencies in the application should be informed to the applicant at a time preferably within 2-3 days. The process of the scrutiny should be very transparent so as to avoid and identify the delay and also to pin point the responsibility. The deficiencies should be resolved by mutual discussion within 15 days.
- Regular updating of forest land and data in records.
- Creation of land data bank by Forest Dept. in advance for Compensatory Afforestation.
- State Forest Department need to process the proposals within strict timelines.
- Process repetition like site inspection by PCCF as well as Regional Office of MOEF, etc. may be avoided.
- More number of Forest Advisory Committees (FACs) may be constituted by MOEF.
- State should maintain the correct and updated record of the forest land to avoid resubmission.
- State should ensure its recommendations to MoEF in a time bound framework as per Forest (Conservation) Rules.
- After the stage -1 clearance is accorded, the proponent should be allowed to start the activities and the forest land should be transferred once the required payments towards NPV, compensatory afforestation is made by the coal companies to the concerned State Government.
- Strengthening of land and R&R Department at all levels for timely action and follow up with State authorities.

- Poverty has got to be addressed effectively for improving environment and this can be done only by ensuring adequate and economically viable supply of Energy.
- A balance has therefore to be struck between Environmental considerations and the urgent need for Economic advancement of the country.
- The question of Forestry and Environmental Clearances has therefore to be looked at from this angle

Figure: 13 Environmental Clearance Flow Chart



2.4 Environment Clearance – Suggested Measures:

- State Pollution Control Board may act in time-bound manner –
 - Public Hearing
 - Report submission
- Standard ToR for OC and UG mines should be circulated by MoEF so that baseline data generation and preparation of EIA/EMP is taken up without going in for ToR presentation at MoEF and obtaining ToR.
- Filing TOR application be done online.
- MoEF may consider standardizing TOR for the projects based on experience of handling coal mining projects since adoption of Environmental Impact Assessment Notification of 2006 which would reduce time in EC appraisal by at least 6 months.
- Dispensation of public hearing in case of projects already having EC and fresh EC is required because of increase in production only without involving any increase in land area).
- Issuing of Prospecting License and Forestry Clearance along with Block allotment Letter in case of unexplored blocks be considered.
- State Official to ensure completion of Public Hearing within the time frame notified in EIA notification i.e. 45 days.
- Dispensation of public hearing in case of projects having only forest land.
- Dispensation of public hearing in case of UG projects as there is negligible environment degradation.
- If SBCB does not complete PH process within stipulated time, MoEF should accept the EIA/EMP for EC. The EC may however be accorded only after the recommendation of SPCB thorough PH proceedings.
- Concept of Single window clearance is needed – By way of formation of inter-ministerial/inter department group who shall be authorized to deal with such clearances in a time bound manner.
- Compensatory afforestation be taken by project preferably through PPP mode with suitable mechanism by State/Central Government.
- Delinking of EC with FC as long as no forest land is used for mining and mining related activities.
- Monitor the Coalfield wise EC, so that the excess production by any project does not attract the requirement of fresh EC as long as the combined production is within the EC capacity.

2.5 Land Acquisition – Factors contributing to Delay

Land acquisition is proving to be one of the major hurdles in starting coal mining projects and expansion of the existing ones. It is mainly due to this reason that mining companies are unable to plan major enhancement of coal production. Shifting of people from places where land has already been acquired is also one of the hurdles for enhancement of coal production.

- Primary reason for difficulties in Land Acquisition = Intense emotional attachment of people to land.
- Right now, mining industry acquires land on permanent basis and the acquired land is not put to use once the mining operations are over.
- Processing of proposals / issuance of notifications and disbursement of payment by State Govt. / District Admn.
- Non-availability of land records / very old records with District Admn.
- Inadequate manpower at Block / Dist. level.
- Slow processing of Govt. land proposals at various level of State Govt.
- Absence of Policy for dealing with encroachers of less than 30 yrs.
- Approval of R&R Plan by State Govt.
- Local resistance - Law & Order situation
- Non-standardization of procedures – varying from State to State.

2.6 Land Acquisition – Suggested Measures:

- Instead land could be taken on lease with clear cut assurance to the land owners that the land will be reclaimed and handed over back to them after the mining operations are over. Naturally reclamation has to be done such that reclaimed land is useful for economic activities like Agriculture and Horticulture etc.
- Digitalization of Land Holding Records and Regular updating of Land titles.
- State to Identify Suitable Site for R&R on Intimation of Allocation of land for coal mining-thus saving time.
- State Govt. should fix Floor Price and Ceiling Price for Compensation Rate for Land purchase from the private parties.
- Taskforce under chairmanship of Revenue Secretary of respective State be constituted to sort-out issues for expediting the land acquisition process.
- This will no doubt cost some money but will go a long way in giving confidence to the land owners that loss of land is only temporary.
- During the period that the land is used for mining operations including the time required for reclamation, the land owners should be paid generous lease rent, which should be 2-3 times the value of their current income from the land.
- In all likelihood, this will go a long way in softening the resistance of the land owners.
- Specialized land acquisition department / agencies by State Governments may facilitate land acquisition process such as IDCO in Odisha, MSIDC in Maharashtra.
- Special land acquisition cell at Dist. level.
- Provide databank of land for public purposes. Maintenance of comprehensive and intelligent map database. Instant production of Cadastral maps of any scales, themes and sizes.
- Processing of land proposals – e-filing.

2.8 Replace and Rehabilitation (R & R):

Additionally, the following may be suggested to streamline the R&R problems:

- Uniform R&R Policy for Coal Mining.
- Implementation of R&R Policy, addressing the genuine concerns of Local Villages/Project Affected Peoples, creating goodwill and mutual trust.
- Identification of Project affected families (PAFs) at the time of project conceptualization stage itself for timely action.
- Identification of R&R site, providing adequate infrastructure and suitable amenities before land acquisition.
- Continuous dialogue with PAFs with an objective to identify their actual requirement by involving the village panchayats and State Govt. authorities. Accordingly the actions are to be taken.
- Ownership verification with family tree jointly by mining companies and state district authorities.

- Finalization of PAFs and display of the list on the notice board and website.
- Categorization of PAFs as per their entitlement in terms of the agreed policy.
- Free shifting of belongings of PAFs for smooth acquisition & land possession.
- Maintenance of updated & correct land records by State Land & Revenue Department.
- Suitable compensation to the affected persons for ensuring reasonable regular income for sustenance and livelihood in terms of National Land Acquisition and R&R Bill, 2011 or any other approved policy.
- Strengthening of land and R&R Department at all levels of Coal Mining Companies for timely action and follow up with State authorities.

2.9 Infrastructure Development:

- Most of the major coalfields not connected with Railway infrastructure.
- Development of Railway infrastructure takes huge time – facing with issues like forest clearance, land acquisition, law & order situation, etc.

2.10 Suggested Measures:

- Substantial increase in production attainable if rail infrastructure strengthened to ensure prompt evacuation of Coal.
- Since Coal companies have investible funds available, Railways should start laying new rail lines and adding/ improving the Railway Sidings in these coalfields.
- New Roads can be constructed and existing ones improved quickly
- Govt. to create railway and road infrastructure in Green Field Areas.
- States to take initiative for construction of common rail/road corridors in potential coal fields.
- Dedicated Rail corridors for coal transport needs to be speeded up preferably through PPP model.
- New Rail links in North Karampur area, Raigarh area, Talchar area need immediate action as major part of the future growth in production is expected from these areas.
- Expansion of Port Handling capacity also needs to be put on fast track.
- Prompt evacuation of coal will create conditions for improvement in production.
- Expeditious development of Rail / Road with State support
- Dedicated freight / coal corridor
- Master Network plan should prepare before allocation of coal blocks to mining companies with firm plan for Rail corridor.

III. CONCLUSION

From the above, it can be construed that the appetite for energy in the world is growing, particularly in developing countries like India, as it is fast on course to industrialization and urbanization. Coal will continue to play an important role in meeting our energy requirements. Onus of fulfilling the coal supply requirement of the country primarily rests on Public Sector Company Coal India Limited and few private mining companies. But, our indigenous production never reaches the existing demand. The gap between energy demand and supply increasing very huge quantity. In order to restrict the gap between demand and indigenous coal availability to further rise, the extent possible, in coming years, Coal Mining Companies has no option but to raise its production level to a great extent by every means. Coal production cannot be started without possession of land, solving R&R problems, getting Environmental and Forestry clearances as well as addressing the coal evacuation problems. It is a pity that the country's economic progress is suffering for shortage of coal of which the country has huge resources. Active support & involvement of respective State Govt. MOC considering 'Reserve Price' for coal blocks – Milestone-based payment to State Govt. Special thrust of State Govt. for land record updation & digitization. Expeditious Environment & Forest clearances – Process simplification, Cut short process repetitions, Single-window approach, more nos. of FACs, EACs. Infrastructure Development: Expeditious development of Rail / Road with State support dedicated freight / coal corridor Master Network before allocation of coal blocks with firm plan for Rail corridor. Special Task Force for monitoring the project implementation. Adoption of a pragmatic approach directed at balancing the Environmental considerations with the need for economic development which will naturally contribute to Environmental improvement would surely go a long way in bridging the gap between Coal Demand and Domestic production.

REFERENCES:

- [1.] http://planningcommission.nic.in/aboutus/committee/wrkgrp12/wg_Coal1406.pdf
- [2.] <http://www.indiaenvironmentportal.org.in/files/coal-steel.pdf>
- [3.] http://www.pwc.in/en_IN/in/assets/pdfs/industries/power-mining/icc-coal-report.pdf
- [4.] www.worldcoal.org/
- [5.] www.coal.nic.in
- [6.] <http://www.coalindia.in/>
- [7.] www.cea.nic.in/
- [8.] <http://powermin.nic.in/>
- [9.] <http://envfor.nic.in/>
- [10.] <http://www.dghindia.org/>
- [11.] en.wikipedia.org/wiki/Coal_by_country
- [12.] <http://www.bp.com/sectiongenericarticle800.do?categoryId=9037183&contentId=7068609>
- [13.] www.ifpenergiesnouvelles.com/.../Panorama2010_10-VA_World-Co
- [14.] http://www.energywatchgroup.org/fileadmin/global/pdf/EWG_Report_Coal_10-07-2007ms.pdf
- [15.] INDIA ENERGY BOOK 2012 - india energy congress
www.indiaenergycongress.in/iec/ieb2012_1.pdf
- [16.] www.business-standard.com › Home › Economy & Policy
- [17.] <http://indianpowersector.com/home/2013/01/sluggish-coal-sector-to-dampen-power-generation/>
- [18.] www.idfc.com/pdf/publications/captive_coal_mining_final.pdf
- [19.] <http://www.observerindia.com/cms/export/orfonline/documents/coal/coal/AES-ppt.pdf>
- [20.] <http://www.indiacore.com/coal.html>
- [21.] http://www.idfc.com/pdf/publications/captive_coal_mining_final.pdf
- [22.] www.cibtech.org/.../PUBLICATIONS/.../12-09-JGEE-Kumar.pdf
- [23.] http://www.apiems.net/archive/apiems2004/pdf/apiems2004_20.2.pdf
- [24.] www.cseindia.org/